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(54) Adaptive time diversity and spatial diversity for OFDM

(57) An adaptable orthogonal frequency-division multiplexing system (OFDM) that uses a multiple input multiple output (MIMO) to having OFDM signals transmitted either in accordance with time diversity to reducing signal fading or in accordance with spatial diversity to increase the data rate. Sub-carriers are classified for

spatial diversity transmission or for time diversity transmission based on the result of a comparison between threshold values and at least one of three criteria. The criteria includes a calculation of a smallest eigen value of a frequency channel response matrix and a smallest element of a diagonal of the matrix and a ratio of the largest and smallest eigen values of the matrix.

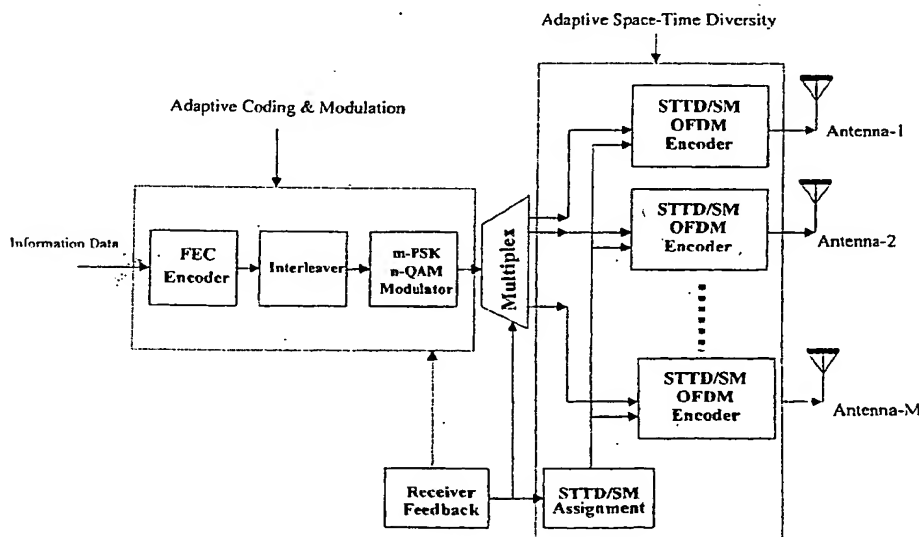


Figure-1



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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 7097

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
P,X	WO 01 45300 A (IOSPAN WIRELESS INC) 21 June 2001 (2001-06-21) * abstract * * page 4, paragraph 4 - page 5, paragraph 5 * * page 6, paragraph 2 - page 7, paragraph 1 * * page 10, paragraph 2 - page 11, paragraph 1 * * page 12, paragraph 2 * * page 14, paragraph 4 - page 15, paragraph 1 * * page 16, paragraph 3 * * page 19, paragraph 2 * * figures 1-5 *	1,9-12, 20, 26-29,36	H04B7/06 H04L1/06 H04L27/26
A	WO 98 09381 A (UNIV LELAND STANFORD JUNIOR) 5 March 1998 (1998-03-05) * abstract * * page 6, line 5 - page 7, line 17 * * page 9, line 23 - line 35 * * page 10, line 20 - line 26 * * page 14, line 10 - page 15, line 24 * * page 19, line 6 - line 11 * * page 19, line 36 - page 20, line 4 *	1,9,11, 20,27,29	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04L H04B
A	WO 99 14871 A (AT & T WIRELESS SERVICES INC) 25 March 1999 (1999-03-25) * abstract * * page 3, line 24 - page 4, line 13 * * page 11, line 5 - line 7 * * figures 1-3 *	1,9,11, 20,27,29	
-/-			
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 8 July 2003	Examiner Lopez Márquez, T
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 7097

DOCUMENTS CONSIDERED TO BE RELEVANT				
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)	
A	<p>LI Y G ET AL: "TRANSMITTER DIVERSITY FOR OFDM SYSTEMS AND ITS IMPACTS ON HIGH-RATE WIRELESS NETWORKS"</p> <p>ICC '99. 1999 IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS. CONFERENCE RECORD. VANCOUVER, CA, JUNE 6 - 10, 1999, IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS, NEW YORK, NY: IEEE, US, vol. 1, 6 June 1999 (1999-06-06), pages 534-538, XP000898323</p> <p>ISBN: 0-7803-5285-8</p> <p>* page 534, left-hand column, paragraph 1</p> <p>- page 535, right-hand column, paragraph 8</p> <p>*</p>	1,9,11, 20,27,29		
A	<p>---</p> <p>HYEON WOO LEE ET AL: "PERFORMANCE ANALYSIS OF DOWN LINK TIME SWITCHED TRANSMIT DIVERSITY (TSTD) IN W-CDMA SYSTEM"</p> <p>VTC 2000-SPRING. 2000 IEEE 51ST. VEHICULAR TECHNOLOGY CONFERENCE PROCEEDINGS. TOKYO, JAPAN, MAY 15-18, 2000, IEEE VEHICULAR TECHNOLOGY CONFERENCE, NEW YORK, NY: IEEE, US, vol. 1 OF 3. CONF. 51, 15 May 2000 (2000-05-15), pages 561-565, XP000970682</p> <p>ISBN: 0-7803-5719-1</p> <p>* page 561, left-hand column, paragraph 4</p> <p>- page 562, left-hand column, paragraph 1</p> <p>*</p>	1,9,11, 20,27,29		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
P,A	<p>---</p> <p>EP 1 037 303 A (MOTOROLA INC)</p> <p>20 September 2000 (2000-09-20)</p> <p>* abstract *</p> <p>* column 2, line 16 - column 3, line 43 *</p> <p>-----</p>	1,9,11, 20,27,29		
The present search report has been drawn up for all claims				
Place of search THE HAGUE		Date of completion of the search 8 July 2003	Examiner Lopez Marquez, T	
CATEGORY OF CITED DOCUMENTS		<p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>-----</p> <p>& : member of the same patent family, corresponding document</p>		
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EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 30 7097

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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08-07-2003

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 0145300	A	21-06-2001	US	6351499 B1	26-02-2002
			AU	2061501 A	25-06-2001
			BR	0016772 A	10-12-2002
			EP	1240730 A1	18-09-2002
			WO	0145300 A1	21-06-2001
			US	6298092 B1	02-10-2001

WO 9809381	A	05-03-1998	AU	4238697 A	19-03-1998
			CA	2302289 A1	05-03-1998
			EP	0920738 A1	09-06-1999
			EP	0931388 A2	28-07-1999
			JP	2001505723 T	24-04-2001
			WO	9809385 A2	05-03-1998
			WO	9809381 A1	05-03-1998
			WO	9809395 A1	05-03-1998
			US	2003972382 A1	17-04-2003
			US	6377631 B1	23-04-2002
			US	6452981 B1	17-09-2002
			US	6144711 A	07-11-2000

WO 9914871	A	25-03-1999	CA	2303388 A1	25-03-1999
			CA	2405875 A1	25-03-1999
			DE	29824760 U1	13-06-2002
			DE	29824761 U1	13-06-2002
			DE	29824762 U1	13-06-2002
			DE	29824763 U1	13-06-2002
			DE	29824765 U1	13-06-2002
			EP	1016228 A1	05-07-2000
			US	6185258 B1	06-02-2001
			WO	9914871 A1	25-03-1999

EP 1037303	A	20-09-2000	EP	1037303 A1	20-09-2000
			CA	2300449 A1	12-09-2000
			JP	2000269869 A	29-09-2000
			US	6373433 B1	16-04-2002
